A VISUAL REFERENCE · grap

grap,
one change at a time

Complete source. One deliberate change. Its actual result. Follow measurements from a small field archive through counts, trends and scientific comparisons. Data coordinates and physical page dimensions have different jobs; each example makes that distinction visible.

The Org file is canonical. Read the searchable HTML beside your editor or use the PDF offline. All measurements and operational quantities are synthetic teaching fixtures.

> **Last changes: 2026-11-16.** Original examples, pinned native rendering and portable source/configuration downloads.

60
worked examples

10
topic families

1
canonical Org source

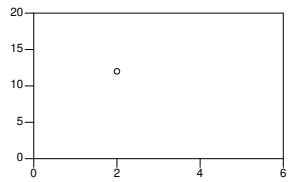
All diagrams at a glance

Choose a diagram to open its complete grap source, explanation and downloads.

01 · First graphs

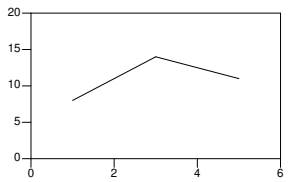
6 diagrams

Separate the physical frame from the data values plotted inside it.



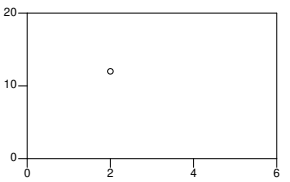
GRA-01-001

Place one reading



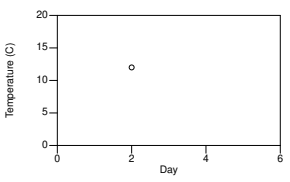
GRA-01-002

Connect successive readings



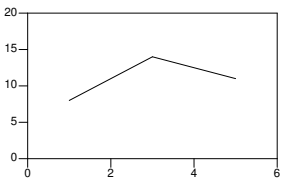
GRA-01-003

Choose the axis ticks



GRA-01-004

Name the axes and units



GRA-01-005

Read a small number list



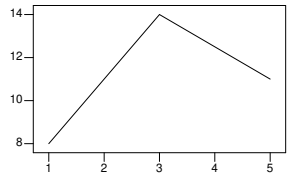
GRA-01-006

Plot a numeric label

02 · Coordinates and ranges

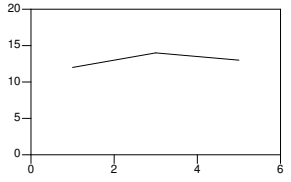
6 diagrams

Choose the domain before interpreting slopes, distances or relative heights.



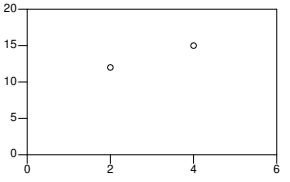
GRA-02-001

Let the data set the range



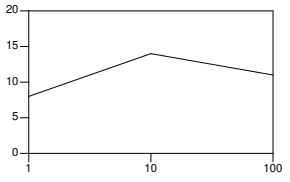
GRA-02-002

Retain a zero baseline



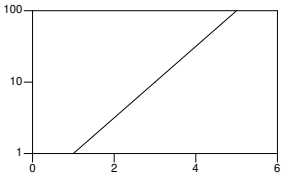
GRA-02-003

Name another coordinate system



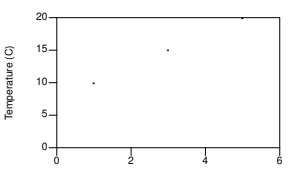
GRA-02-004

Use a logarithmic horizontal axis



GRA-02-005

Use a logarithmic value axis



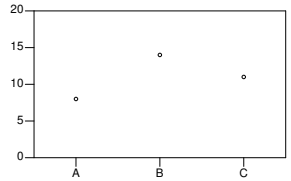
GRA-02-006

Convert the values before drawing

03 · Axes, ticks and grids

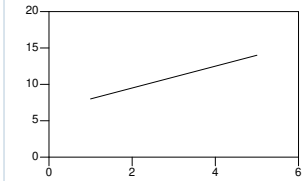
6 diagrams

Use ticks for reading values and restrained grids for comparison.



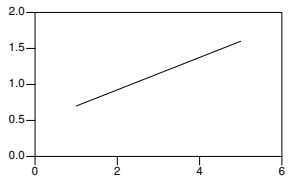
GRA-03-001

Name categorical tick positions



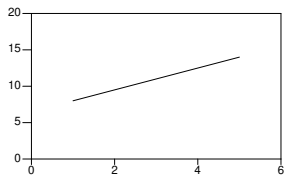
GRA-03-002

Generate regularly spaced ticks



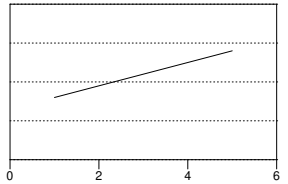
GRA-03-003

Format tick precision



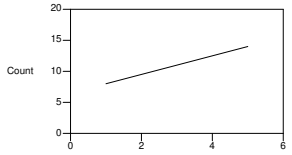
GRA-03-004

Turn ticks outward



GRA-03-005

Add a light reading grid



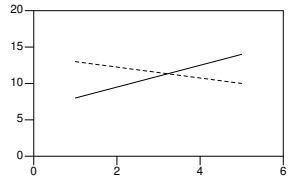
GRA-03-006

Align the value label horizontally

04 · Lines, markers and series

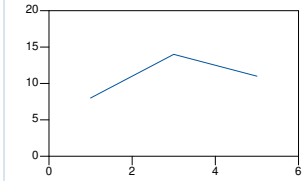
6 diagrams

Distinguish series with labels and line styles as well as color.



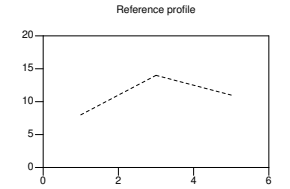
GRA-04-001

Name independent series



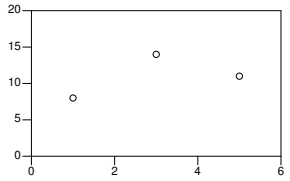
GRA-04-002

Set a line color



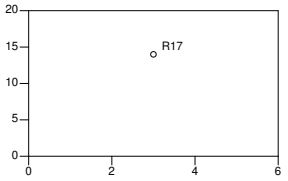
GRA-04-003

Use a dashed comparison



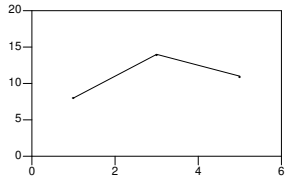
GRA-04-004

Draw separate markers



GRA-04-005

Label one selected reading



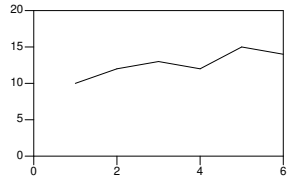
GRA-04-006

Add markers to a line

05 · Local data and expressions

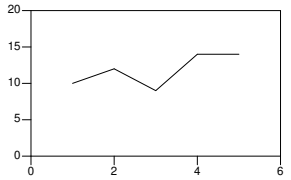
6 diagrams

Keep inputs close to the complete source and make transformations visible.



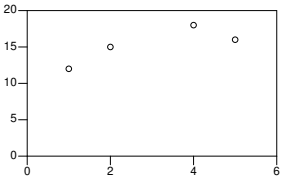
GRA-05-001

Read the local measurement table



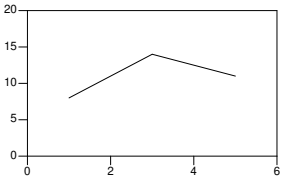
GRA-05-002

Transform columns while reading



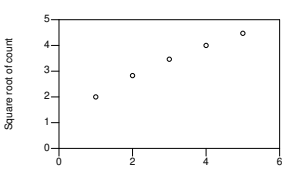
GRA-05-003

Filter flagged observations



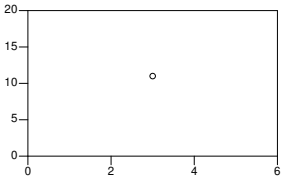
GRA-05-004

Embed data for a standalone snippet



GRA-05-005

Calculate a transformed reading



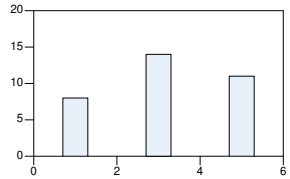
GRA-05-006

Print a checked intermediate value

06 · Bars and prepared distributions

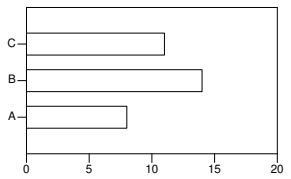
6 diagrams

Make bar baselines and distribution definitions explicit before adjusting their appearance.



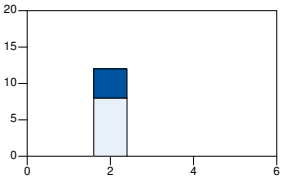
GRA-06-001

Draw vertical counts



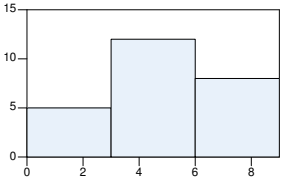
GRA-06-002

Draw horizontal counts



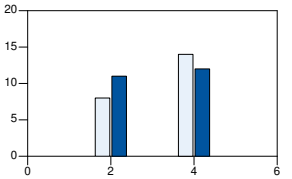
GRA-06-003

Stack a known component



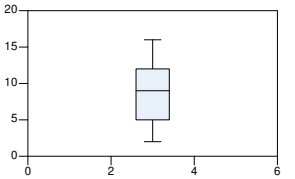
GRA-06-004

Draw prepared histogram bins



GRA-06-005

Offset grouped bars



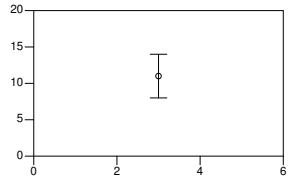
GRA-06-006

Draw a prepared box summary

07 · Scientific annotations

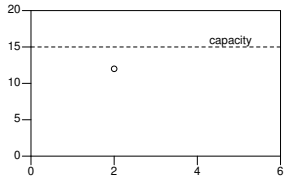
6 diagrams

Keep supplied uncertainty, thresholds and derived geometry distinct from the observations.



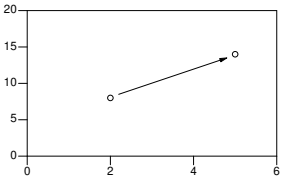
GRA-07-001

Show a supplied uncertainty interval



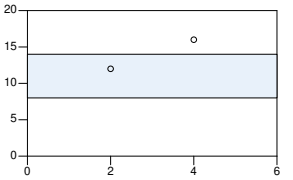
GRA-07-002

Add a capacity threshold



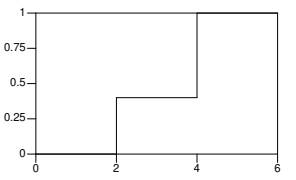
GRA-07-003

Explain a change with an arrow



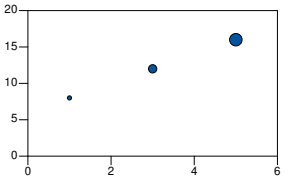
GRA-07-004

Shade a reference band



GRA-07-005

Draw a right-continuous cumulative curve



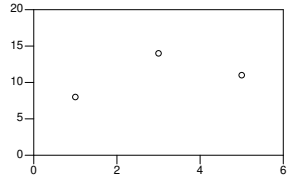
GRA-07-006

Scale marker area to count

08 · Macros and controlled repetition

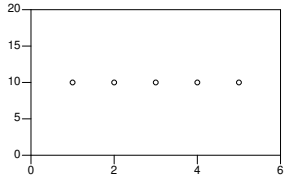
6 diagrams

Name repeated work while leaving the plotting rule visible in the complete source.



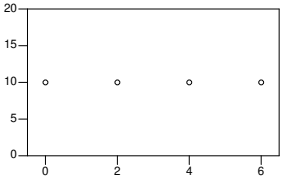
GRA-08-001

Name a marker operation



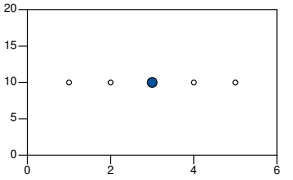
GRA-08-002

Generate a regular sampling grid



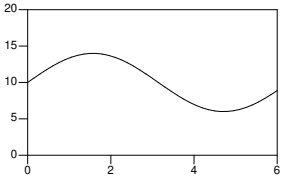
GRA-08-003

Choose an explicit sampling step



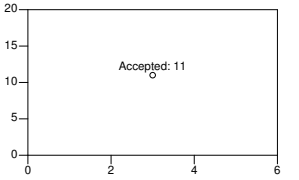
GRA-08-004

Select a flagged point inside a loop



GRA-08-005

Trace an analytical function



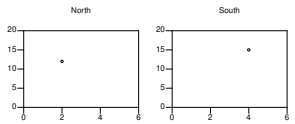
GRA-08-006

Format a calculated annotation

09 · Panels and pic integration

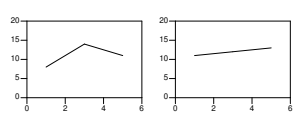
6 diagrams

Combine charts with explicit alignment instead of letting unrelated scales appear comparable.



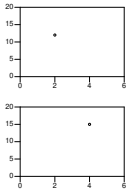
GRA-09-001

Place two charts beside each other



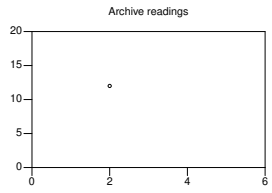
GRA-09-002

Keep panel scales identical



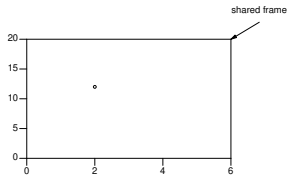
GRA-09-003

Stack panels vertically



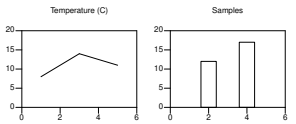
GRA-09-004

Add a caption in pic coordinates



GRA-09-005

Add an external frame callout



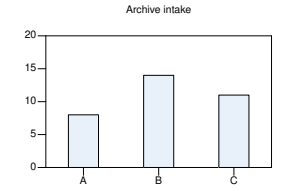
GRA-09-006

Separate a trend from a count panel

10 · Finished archive charts

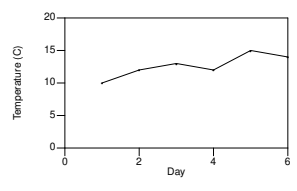
6 diagrams

Combine established techniques into small figures with one stated analytical purpose.



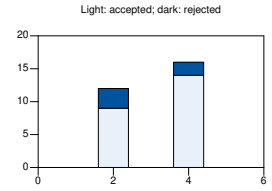
GRA-10-001

Report intake by batch



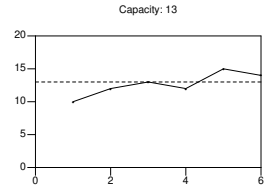
GRA-10-002

Report a temperature sequence



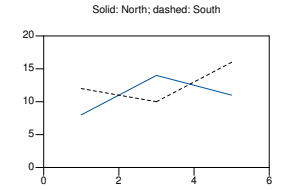
GRA-10-003

Compare accepted and rejected totals



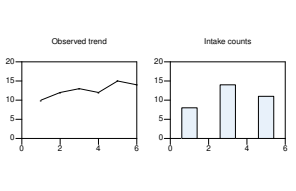
GRA-10-004

Check readings against a capacity



GRA-10-005

Report two independent station trends



GRA-10-006

Finish a paired archive report

READING THE TOUR

Three ways to see a change

Read the source

Each example is a complete file. Identify the syntax introduced before changing it.

Inspect the output

Open a gallery thumbnail, compare the native figure and follow a sibling example.

Make a change

Download the source/configuration ZIP, make the suggested edit and repeat its exact command.

Browse this tour with the gallery, search and topic filters. Stable IDs identify chapters and examples; Back to diagram overview returns to the corresponding thumbnail. The shared configuration sets appearance, never example data.

Reproduce the diagrams

The reviewed native toolchain is **GNU pic and groff 1.25.0, grap 1.49, pdfcrop 1.42, Ghostscript 10.08.0 and Poppler 26.11.0**. Exact checksums and publisher versions are recorded in `VERSIONS.json`. Install GNU groff, Ghostscript, Poppler and TeX Live with pdfcrop. Install grap 1.49 as well. The driver checks the native versions and the bundled Nimbus Sans font programs. Native PDF is produced by groff with all used fonts embedded, then cropped by pdfcrop; Poppler creates the SVG and PNG companions.

Install the shared publisher with `make setup` in its sibling directory. Activate that Python environment before using a standalone bundle, or install its pinned `requirements.txt` in a fresh environment. The published HTML embeds figures and works offline; keep the companion directories for individual downloads.

```
make full
make check
tools/render --version
tools/render examples/GRA-01-001.grap
```

Command or configuration	Meaning in this tour
`tools/render SOURCE`	Run the pinned native pipeline and write PDF, SVG and PNG.
`config/render.json`	Reviewed tool versions and bundled font checksums.
`SOURCE_DATE_EPOCH=0`	Fix native build-date inputs; the driver removes PDF date metadata.
`make full`	Explicitly execute reviewed programs, then build HTML and PDF.
`make`	Reuse verified local results; never execute examples implicitly.
`make check`	Verify output hashes, example IDs and offline links.
`pic -S`	Expand the complete drawing with native safe mode.
`groff -Tpdf -P-e -P-W -P-pa3`	Embed all used fonts, make warnings fatal and use a generous A3 working canvas.
`pdfcrop --hires --margins 10`	Trim the native PDF and preserve a ten-point margin.
`pdftocairo -svg`	Convert the native PDF to its self-contained SVG companion.
`pdftocairo -png -singlefile -r 120`	Produce the downloadable PNG at a fixed resolution.
`grap -d config/grap.defines`	Read the bundled standard macro definitions before pic.

The grap 1.49 version query returns exit status 5 while printing its banner. The driver checks that banner; every actual example render must return zero.

Download the complete reproduction bundle to run all examples, or inspect the shared render configuration. After installing system tools and the shared Python dependencies, preparation and rendering use no network. SVG is self-contained vector artwork; native PDF pages are placed directly in the guide. Repair sources rather than editing generated figures.

01 · First graphs

Separate the physical frame from the data values plotted inside it.

GRA-01-001

Place one reading

A circle places one supplied reading inside explicit data limits. Use a fixed frame so later examples can be compared without changing their scale.

Compare with groff document and diagram tour.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 2,12 radius .04
.G2
```

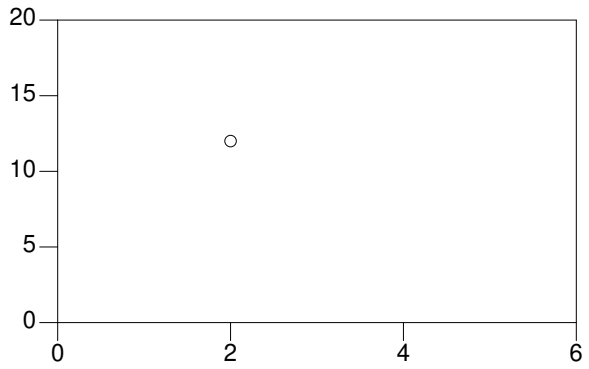
Parameter	Meaning in this example
`coord x / y`	Define the horizontal and vertical data ranges.
`circle at`	Place a marker at one data coordinate.

Render this diagram

```
tools/render examples/GRA-01-001.grap
```

Try changing: Move the reading to 3,14.

Actual output



GRA-01-001 · grap native output

grap · exit 0

GRA-01-002

Connect successive readings

Next commands extend one named sequence in source order. Use a line for ordered measurements whose connection is meaningful.

Compare with GRA-01-001 · Place one reading.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
next at 1,8
next at 3,14
next at 5,11
.G2
```

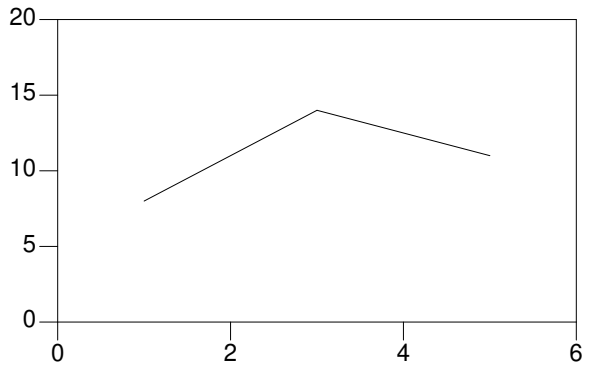
Parameter	Meaning in this example
`draw solid`	Connect successive points with a solid line.
`next at`	Append a point to the sequence.

Render this diagram

```
tools/render examples/GRA-01-002.grap
```

Try changing: Change the middle value to 16.

Actual output



GRA-01-002 · grap native output

grap · exit 0

GRA-01-003

Choose the axis ticks

Explicit ticks make the reference values deliberate. Use them when a report needs the same visible scale across several figures.

Compare with GRA-01-002 · Connect successive readings.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
ticks left at 0,10,20
circle at 2,12 radius .04
.G2
```

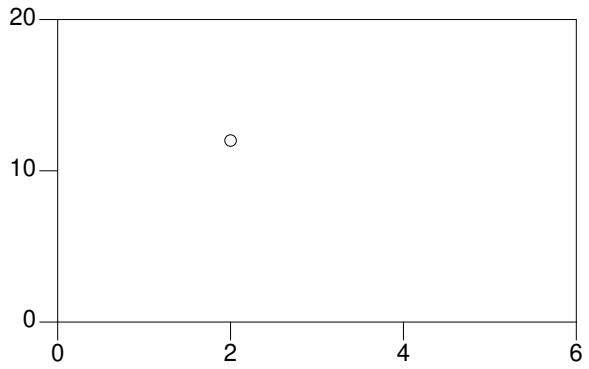
Parameter	Meaning in this example
`ticks left at`	Replace automatic left-axis ticks with these values.

Render this diagram

```
tools/render examples/GRA-01-003.grap
```

Try changing: Add a tick at 15.

Actual output



GRA-01-003 · grap native output

grap · exit 0

GRA-01-004

Name the axes and units

Axis labels explain what the coordinates measure. Use a unit in the value label so a numeric reading is not ambiguous.

Compare with GRA-01-003 · Choose the axis ticks.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label bottom "Day"
label left "Temperature (C)" left .35
circle at 2,12 radius .04
.G2
```

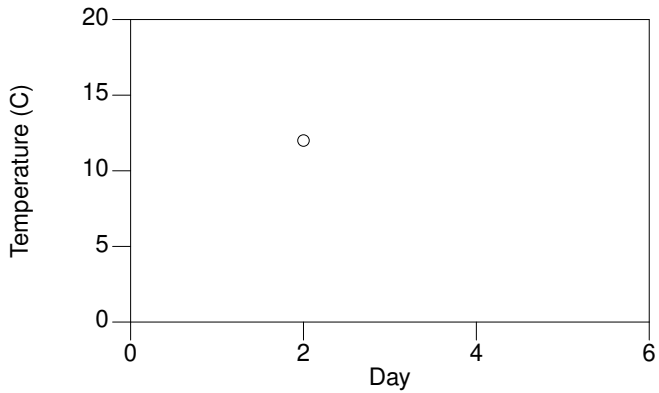
Parameter	Meaning in this example
`label`	Attach explanatory text to a side of the frame.

Render this diagram

```
tools/render examples/GRA-01-004.grap
```

Try changing: Change Temperature (C) to Count.

Actual output



GRA-01-004 · grap native output

grap · exit 0

GRA-01-005

Read a small number list

A numeric list supplies x and y values without repeating next. Use it for a short complete dataset that belongs with the source.

Compare with GRA-01-004 · Name the axes and units.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
1 8
3 14
5 11
.G2
```

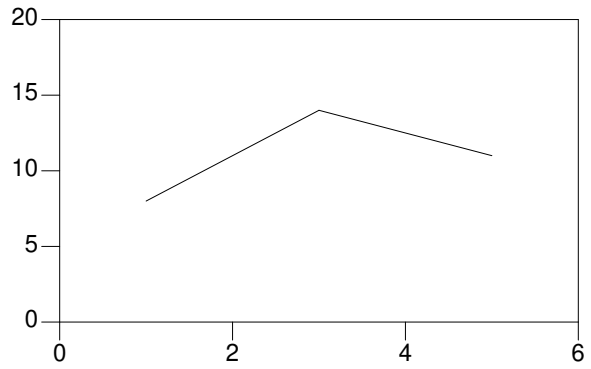
Parameter	Meaning in this example
`Two numeric columns`	Interpret each row as one x,y pair.

Render this diagram

```
tools/render examples/GRA-01-005.grap
```

Try changing: Add a row 6 13.

Actual output



GRA-01-005 · grap native output

grap · exit 0

GRA-01-006

Plot a numeric label

Plot formats a supplied value at a chosen coordinate. Use it when the number itself communicates more than an unlabeled marker.

Compare with GRA-01-005 · Read a small number list.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
plot 12 at 2,12
.G2
```

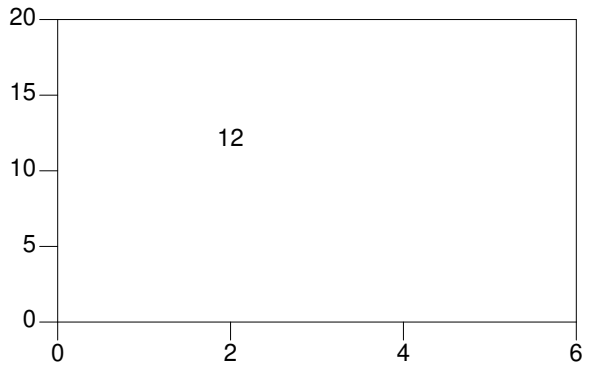
Parameter	Meaning in this example
`plot VALUE at`	Print the value at the supplied data coordinate.

Render this diagram

```
tools/render examples/GRA-01-006.grap
```

Try changing: Change the value and its vertical coordinate to 15.

Actual output



GRA-01-006 · grap native output

grap · exit 0

02 · Coordinates and ranges

Choose the domain before interpreting slopes, distances or relative heights.

GRA-02-001

Let the data set the range

Without coord, grap derives a range from the supplied points. Use automatic limits for exploration, then fix them before comparing panels.

Compare with GRA-01-002 · Connect successive readings.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
draw solid
1 8
3 14
5 11
.G2
```

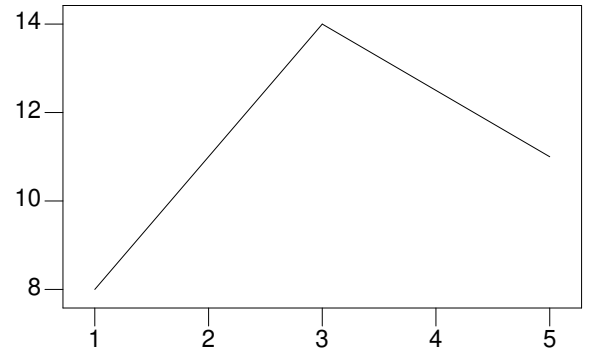
Parameter	Meaning in this example
`No coord statement`	Allow the plotted values to determine the range.

Render this diagram

```
tools/render examples/GRA-02-001.grap
```

Try changing: Add a point at 8,18 and inspect the new limits.

Actual output



GRA-02-001 · grap native output

grap · exit 0

GRA-02-002

Retain a zero baseline

A zero baseline keeps bar or height comparisons proportional. Use explicit limits to avoid exaggerating a narrow variation.

Compare with GRA-02-001 · Let the data set the range.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
1 12
3 14
5 13
.G2
```

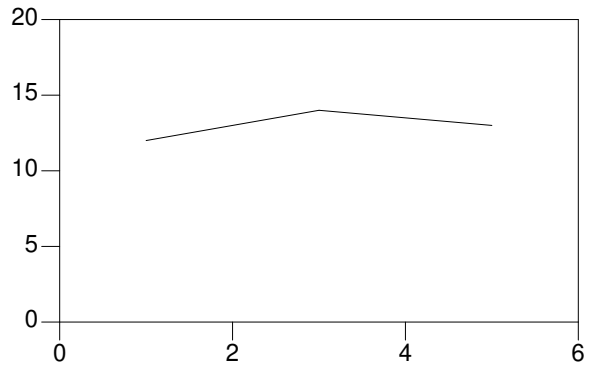
Parameter	Meaning in this example
`y 0,20`	Keep zero visible below the readings.

Render this diagram

```
tools/render examples/GRA-02-002.grap
```

Try changing: Compare with y 10,16.

Actual output



GRA-02-002 · grap native output

grap · exit 0

GRA-02-003

Name another coordinate system

A named system can express the same frame in different units. Use it when a second set of values needs a known linear conversion.

Compare with GRA-02-002 · Retain a zero baseline.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
coord pct x 0,6 y 0,100
circle at 2,12 radius .04
circle at pct 4,75 radius .04
.G2
```

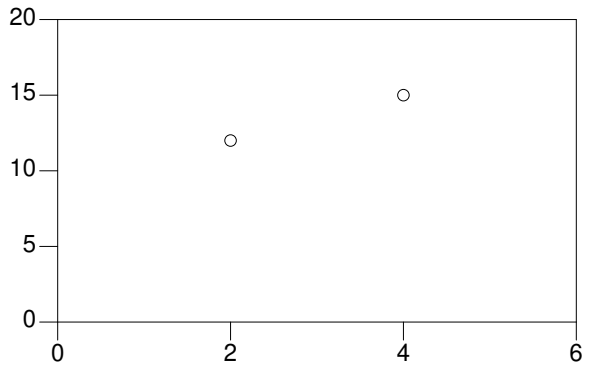
Parameter	Meaning in this example
`coord pct`	Create a second named mapping within the frame.
`at pct`	Interpret this point using that mapping.

Render this diagram

```
tools/render examples/GRA-02-003.grap
```

Try changing: Change the percentage reading to 50.

Actual output



GRA-02-003 · grap native output

grap · exit 0

GRA-02-004

Use a logarithmic horizontal axis

A log axis gives equal distance to equal ratios. Use strictly positive values when the time or concentration domain spans orders of magnitude.

Compare with GRA-02-003 · Name another coordinate system.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 1,100 y 0,20
coord log x
draw solid
1 8
10 14
100 11
.G2
```

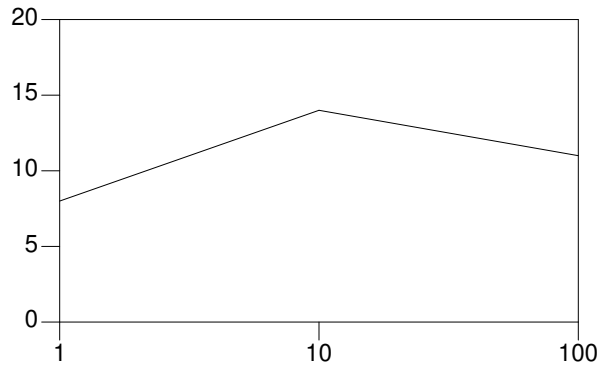
Parameter	Meaning in this example
`log x`	Map the horizontal data logarithmically.

Render this diagram

```
tools/render examples/GRA-02-004.grap
```

Try changing: Add a reading at 30,16.

Actual output



GRA-02-004 · grap native output

grap · exit 0

GRA-02-005

Use a logarithmic value axis

A logarithmic value scale can reveal multiplicative growth. Keep zero out of the domain and state that equal vertical distances represent equal ratios.

Compare with GRA-02-004 · Use a logarithmic horizontal axis.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 1,100
coord log y
draw solid
1 1
3 10
5 100
.G2
```

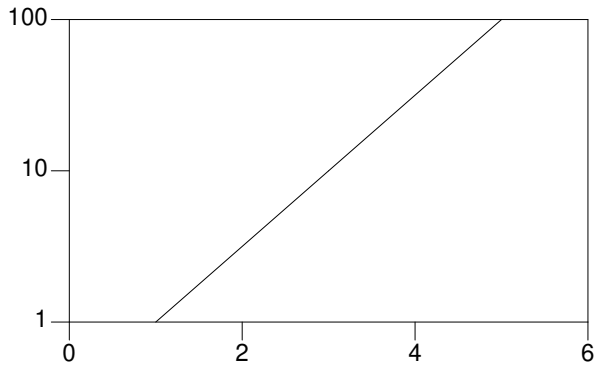
Parameter	Meaning in this example
`log y`	Map positive vertical values logarithmically.

Render this diagram

```
tools/render examples/GRA-02-005.grap
```

Try changing: Change the middle value to 20.

Actual output



GRA-02-005 · grap native output

grap · exit 0

GRA-02-006

Convert the values before drawing

A numeric expression can change units without changing the source observations. Use a visible conversion so the axis label and plotted values agree.

Compare with GRA-02-005 · Use a logarithmic value axis.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label left "Temperature (C)" left .35
next at 1,(50-32)*5/9
next at 3,(59-32)*5/9
next at 5,(68-32)*5/9
.G2
```

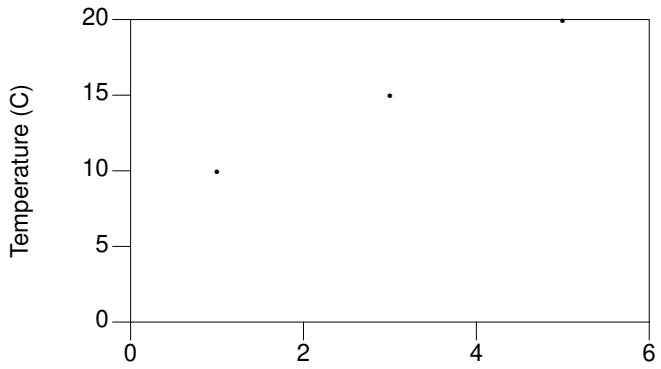
Parameter	Meaning in this example
`(F-32)*5/9`	Convert each supplied Fahrenheit reading to Celsius.

Render this diagram

```
tools/render examples/GRA-02-006.grap
```

Try changing: Add a Fahrenheit value of 77 at day 6.

Actual output



GRA-02-006 · grap native output

grap · exit 0

03 · Axes, ticks and grids

Use ticks for reading values and restrained grids for comparison.

GRA-03-001

Name categorical tick positions

Tick strings can explain numeric category positions. Use them for named intake batches instead of displaying arbitrary category codes.

Compare with GRA-01-003 · Choose the axis ticks.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
ticks bottom at 1 "A",3 "B",5 "C"
circle at 1,8
circle at 3,14
circle at 5,11
.G2
```

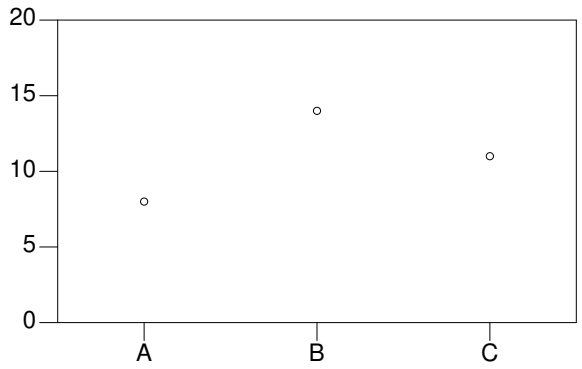
Parameter	Meaning in this example
`Tick string`	Replace a numeric tick label with its supplied category name.

Render this diagram

```
tools/render examples/GRA-03-001.grap
```

Try changing: Rename A, B and C to North, East and West.

Actual output



GRA-03-001 · grap native output

grap · exit 0

GRA-03-002

Generate regularly spaced ticks

A from/to range avoids listing regular ticks individually. Use a visible interval that matches the precision readers need.

Compare with GRA-03-001 · Name categorical tick positions.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
ticks left from 0 to 20 by 5
line from 1,8 to 5,14
.G2
```

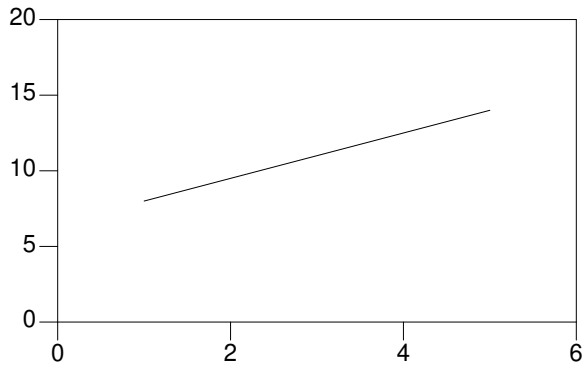
Parameter	Meaning in this example
`from / to / by`	Generate ticks over a fixed interval.

Render this diagram

```
tools/render examples/GRA-03-002.grap
```

Try changing: Change the interval to 4.

Actual output



GRA-03-002 · grap native output

grap · exit 0

GRA-03-003

Format tick precision

A format string controls displayed precision. Use one decimal place when the measurement scale carries tenths rather than whole counts.

Compare with GRA-03-002 · Generate regularly spaced ticks.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,2
ticks left from 0 to 2 by .5 "%.1f"
line from 1,.7 to 5,1.6
.G2
```

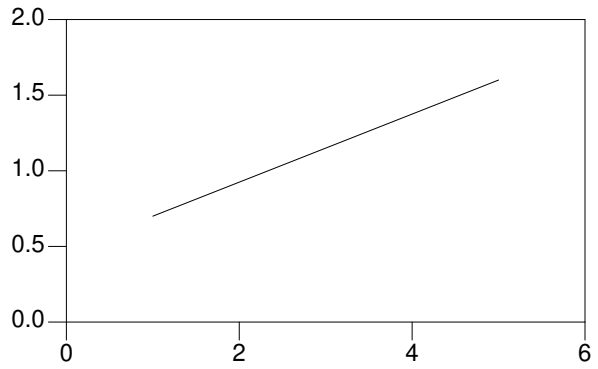
Parameter	Meaning in this example
`"%.1f"`	Print the tick value with one decimal place.

Render this diagram

```
tools/render examples/GRA-03-003.grap
```

Try changing: Change the format to %.2f.

Actual output



GRA-03-003 · grap native output

grap · exit 0

GRA-03-004

Turn ticks outward

Outward ticks leave the interior clearer. Use an explicit physical tick length when preparing a small printed chart.

Compare with GRA-03-003 · Format tick precision.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
ticks bottom out .08 from 0 to 6 by 2
line from 1,8 to 5,14
.G2
```

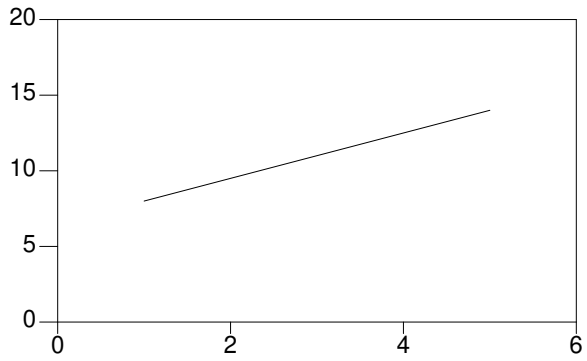
Parameter	Meaning in this example
`out .08`	Draw ticks 0.08 inches outside the frame.

Render this diagram

```
tools/render examples/GRA-03-004.grap
```

Try changing: Reduce the length to .04.

Actual output



GRA-03-004 · grap native output

grap · exit 0

GRA-03-005

Add a light reading grid

Grid lines provide horizontal reference across the plot. Use a dotted style and omit duplicate grid labels when ticks already identify the values.

Compare with GRA-03-004 · Turn ticks outward.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
grid left dotted from 0 to 20 by 5 ""
line from 1,8 to 5,14
.G2
```

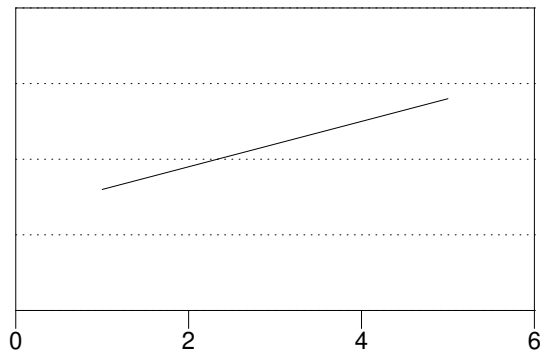
Parameter	Meaning in this example
`grid left`	Extend references horizontally from the left axis.
`""`	Omit labels on the grid lines.

Render this diagram

```
tools/render examples/GRA-03-005.grap
```

Try changing: Change the grid interval to 10.

Actual output



GRA-03-005 · grap native output

grap · exit 0

GRA-03-006

Align the value label horizontally

An unaligned side label stays horizontal. Use it when a short unit caption reads better beside a small chart than as rotated text.

Compare with GRA-03-005 · Add a light reading grid.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label left "Count" unaligned left .45
line from 1,8 to 5,14
.G2
```

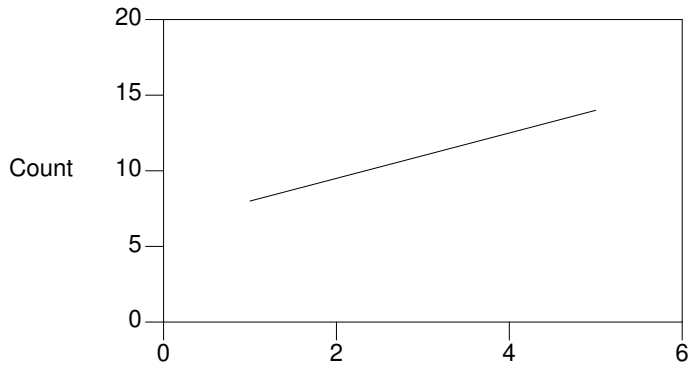
Parameter	Meaning in this example
unaligned	Keep the side label horizontal.

Render this diagram

```
tools/render examples/GRA-03-006.grap
```

Try changing: Replace Count with Samples.

Actual output



GRA-03-006 · grap native output

grap · exit 0

04 · Lines, markers and series

Distinguish series with labels and line styles as well as color.

GRA-04-001

Name independent series

Named drawing streams prevent one series from connecting to another. Use a separate next sequence for each field station.

Compare with GRA-01-002 · Connect successive readings.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw North solid
draw South dashed
next North at 1,8
next South at 1,13
next North at 5,14
next South at 5,10
.G2
```

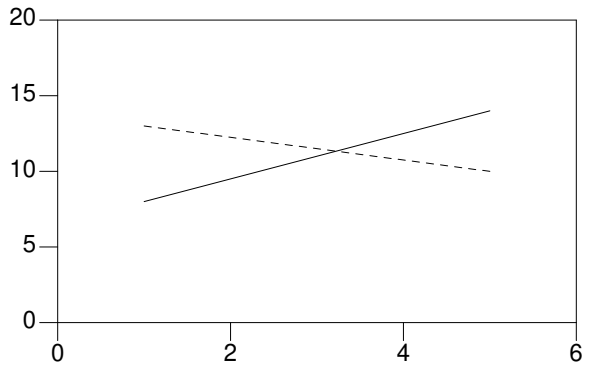
Parameter	Meaning in this example
`draw NAME`	Define an independent sequence of connected points.

Render this diagram

```
tools/render examples/GRA-04-001.grap
```

Try changing: Change the South endpoint to 16.

Actual output



GRA-04-001 · grap native output

grap · exit 0

GRA-04-002

Set a line color

Color can reinforce a series identity. Use a named local color while keeping the line shape and labels intelligible in monochrome.

Compare with GRA-04-001 · Name independent series.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid color "blue"
1 8
3 14
5 11
.G2
```

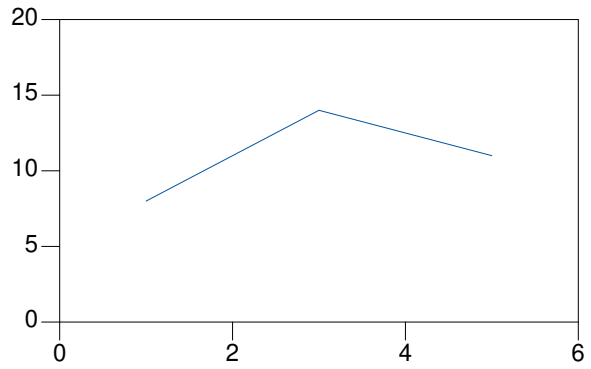
Parameter	Meaning in this example
`color`	Select the color of the line stroke.

Render this diagram

```
tools/render examples/GRA-04-002.grap
```

Try changing: Change blue to orange.

Actual output



GRA-04-002 · grap native output

grap · exit 0

GRA-04-003

Use a dashed comparison

A dashed line distinguishes a supplied reference from ordinary observations. Use it for a target profile rather than another unlabeled measurement stream.

Compare with GRA-04-002 · Set a line color.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw dashed
label top "Reference profile"
1 8
3 14
5 11
.G2
```

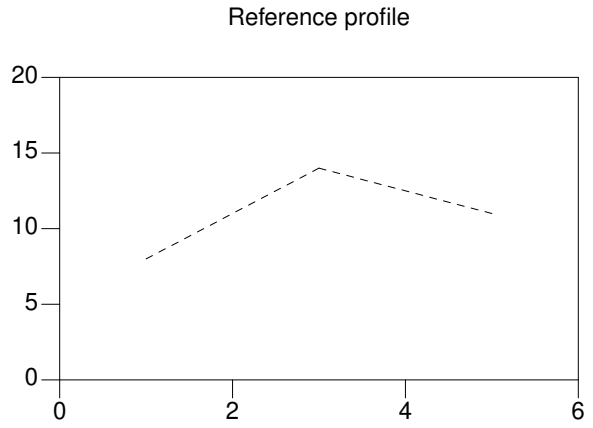
Parameter	Meaning in this example
dashed	Draw the same values with a broken stroke.

Render this diagram

```
tools/render examples/GRA-04-003.grap
```

Try changing: Change dashed to dotted.

Actual output



GRA-04-003 · grap native output

grap · exit 0

GRA-04-004

Draw separate markers

Individual circles avoid implying interpolation. Use them when samples have independent positions rather than an ordered connecting path.

Compare with GRA-04-003 · Use a dashed comparison.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 1,8 radius .045
circle at 3,14 radius .045
circle at 5,11 radius .045
.G2
```

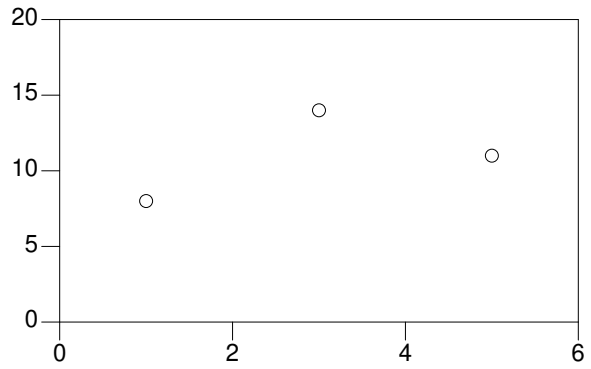
Parameter	Meaning in this example
`radius`	Set marker radius in physical inches.

Render this diagram

```
tools/render examples/GRA-04-004.grap
```

Try changing: Increase the marker radius to .06.

Actual output



GRA-04-004 · grap native output

grap · exit 0

GRA-04-005

Label one selected reading

An offset text label can identify an observation without covering it. Use a short name and keep the underlying point visible.

Compare with GRA-04-004 · Draw separate markers.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 3,14 radius .04
"R17" ljust at 3.2,15
.G2
```

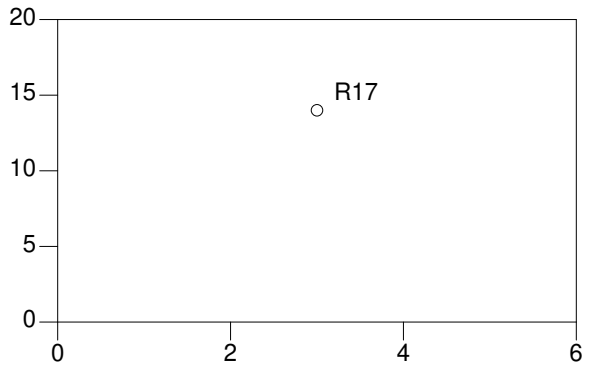
Parameter	Meaning in this example
`ljust`	Anchor the label at its left edge.

Render this diagram

```
tools/render examples/GRA-04-005.grap
```

Try changing: Rename R17 and move the label higher.

Actual output



GRA-04-005 · grap native output

grap · exit 0

GRA-04-006

Add markers to a line

A plot string can mark every point on a connected sequence. Use this when individual sampling positions matter alongside the trend.

Compare with GRA-04-005 · Label one selected reading.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid bullet
1 8
3 14
5 11
.G2
```

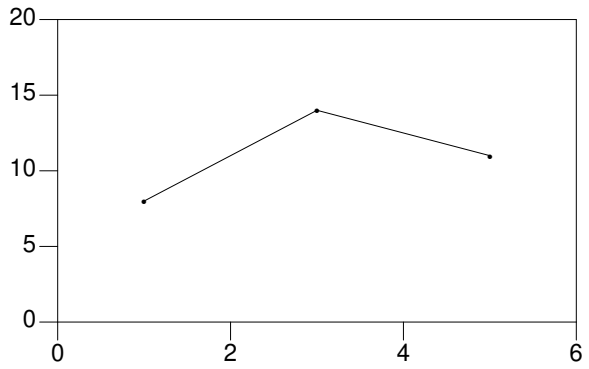
Parameter	Meaning in this example
`bullet`	Use the bundled marker macro at every observation.

Render this diagram

```
tools/render examples/GRA-04-006.grap
```

Try changing: Change bullet to plus.

Actual output



GRA-04-006 · grap native output

grap · exit 0

05 · Local data and expressions

Keep inputs close to the complete source and make transformations visible.

GRA-05-001

Read the local measurement table

Copy imports a bundled numeric table. Use it when the same observations belong in several charts without manually retyping them.

Compare with GRA-01-005 · Read a small number list.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
copy "data/readings.txt"
.G2
```

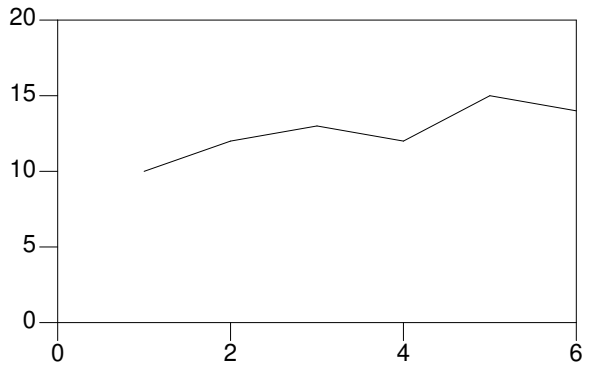
Parameter	Meaning in this example
`copy "data/readings.txt"`	Read the bundled two-column input file.

Render this diagram

```
tools/render examples/GRA-05-001.grap
```

Try changing: Change the last value in the local table.

Actual output



GRA-05-001 · grap native output

grap · exit 0

GRA-05-002

Transform columns while reading

A thru body receives the fields of each input row. Use it to calculate an accepted count from total and rejected counts.

Compare with GRA-05-001 · Read the local measurement table.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
copy "data/batches.txt" thru { next at $1,$2-$3; }
.G2
```

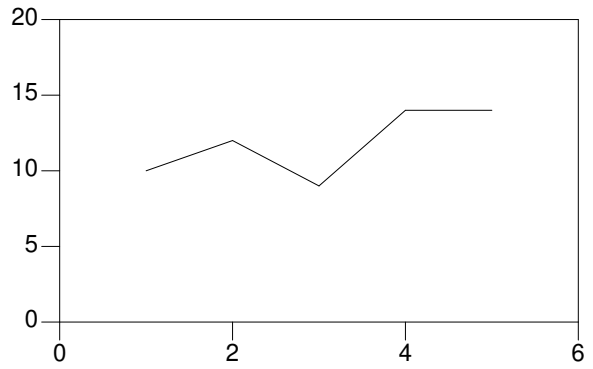
Parameter	Meaning in this example
`$1 / $2 / $3`	Refer to day, total and rejected fields.
`thru`	Apply the same drawing statement to every row.

Render this diagram

```
tools/render examples/GRA-05-002.grap
```

Try changing: Plot $3 instead to show rejected counts.

Actual output



GRA-05-002 · grap native output

grap · exit 0

GRA-05-003

Filter flagged observations

A condition inside thru can omit an invalid observation. Use an explicit flag and explain that filtering changes the plotted population.

Compare with GRA-05-002 · Transform columns while reading.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
copy "data/batches.txt" thru { if $4==1 then { circle at $1,$2 radius .04; }; }
.G2
```

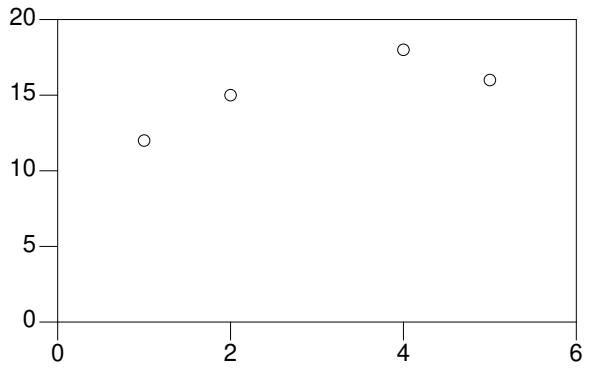
Parameter	Meaning in this example
`$4==1`	Keep only rows whose supplied valid flag is one.

Render this diagram

```
tools/render examples/GRA-05-003.grap
```

Try changing: Change one valid flag from 1 to 0.

Actual output



GRA-05-003 · grap native output

grap · exit 0

GRA-05-004

Embed data for a standalone snippet

Copy until keeps a short dataset inside the source file. Use it when a small drawing should travel without a separate data file.

Compare with GRA-05-003 · Filter flagged observations.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
copy until "END" thru { next at $1,$2; }
1 8
3 14
5 11
END
.G2
```

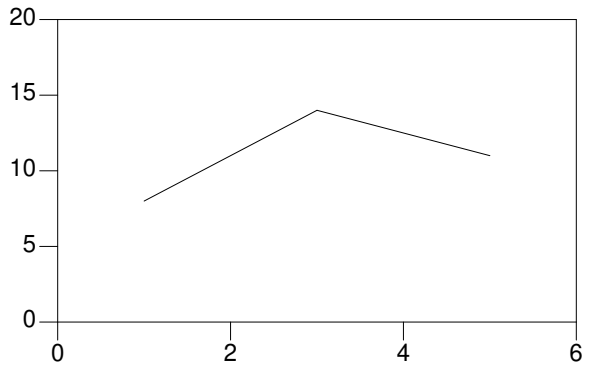
Parameter	Meaning in this example
`until "END"`	Read rows until the explicit terminator.

Render this diagram

```
tools/render examples/GRA-05-004.grap
```

Try changing: Add a new data row before END.

Actual output



GRA-05-004 · grap native output

grap · exit 0

GRA-05-005

Calculate a transformed reading

A square root makes a transformation visible in the plotting statement. Use it only when that transformation has a defined analytical purpose.

Compare with GRA-05-004 · Embed data for a standalone snippet.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,5
label left "Square root of count" left .4
for d from 1 to 5 do { circle at d,sqrt(d*4) radius .035; }
.G2
```

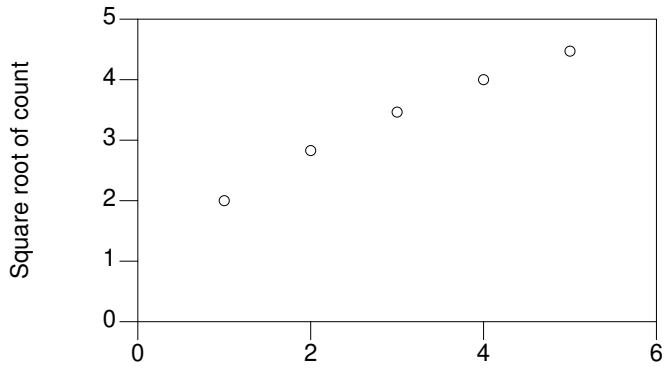
Parameter	Meaning in this example
`sqrt`	Transform the supplied count before placing the point.

Render this diagram

```
tools/render examples/GRA-05-005.grap
```

Try changing: Replace the square root with the raw d*4 count and change the axis range.

Actual output



GRA-05-005 · grap native output

grap · exit 0

GRA-05-006

Print a checked intermediate value

Print records a calculated value in the native diagnostics. Use it while checking a transformation, with the same expression supplying the visible point.

Compare with GRA-05-005 · Calculate a transformed reading.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
value=14-3
print value
circle at 3,value radius .04
.G2
```

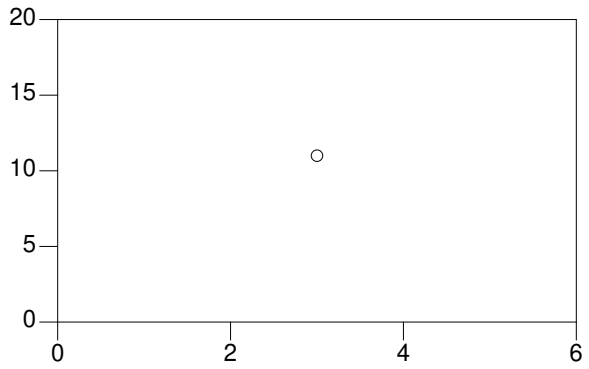
Parameter	Meaning in this example
`print`	Write the checked intermediate result to the native log.

Render this diagram

```
tools/render examples/GRA-05-006.grap
```

Try changing: Change the rejected count from 3 to 5.

Actual output



GRA-05-006 · grap native output

grap · exit 0

06 · Bars and prepared distributions

Make bar baselines and distribution definitions explicit before adjusting their appearance.

GRA-06-001

Draw vertical counts

A vertical bar starts at zero and represents a supplied count. Use the width to separate categorical values clearly.

Compare with GRA-01-005 · Read a small number list.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
bar up 1 ht 8 wid .6 fillcolor "wash"
bar up 3 ht 14 wid .6 fillcolor "wash"
bar up 5 ht 11 wid .6 fillcolor "wash"
.G2
```

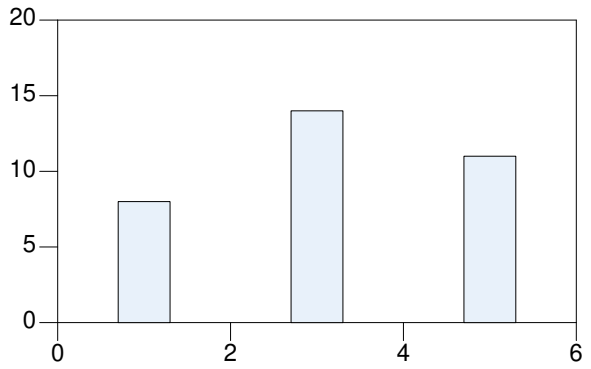
Parameter	Meaning in this example
`bar up`	Extend a bar upwards from its baseline.
`wid .6`	Use a width of 0.6 data units.

Render this diagram

```
tools/render examples/GRA-06-001.grap
```

Try changing: Increase all bar widths to .9.

Actual output



GRA-06-001 · grap native output

grap · exit 0

GRA-06-002

Draw horizontal counts

A rightward bar exchanges the roles of category position and value. Use it when category names need more horizontal room.

Compare with GRA-06-001 · Draw vertical counts.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,20 y 0,4
ticks left at 1 "A",2 "B",3 "C"
bar right 1 ht 8 wid .6
bar right 2 ht 14 wid .6
bar right 3 ht 11 wid .6
.G2
```

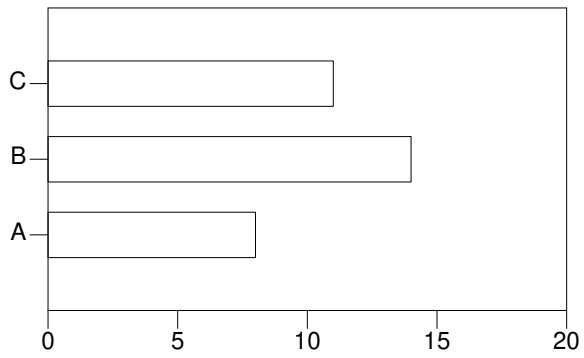
Parameter	Meaning in this example
`bar right`	Extend a bar horizontally from zero.

Render this diagram

```
tools/render examples/GRA-06-002.grap
```

Try changing: Rename the categories to field station names.

Actual output



GRA-06-002 · grap native output

grap · exit 0

GRA-06-003

Stack a known component

A base offset places one component above another. Use it when the supplied components sum to a meaningful total.

Compare with GRA-06-002 · Draw horizontal counts.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
bar up 2 ht 8 wid .8 fillcolor "wash"
bar up 2 ht 4 base 8 wid .8 fillcolor "blue"
.G2
```

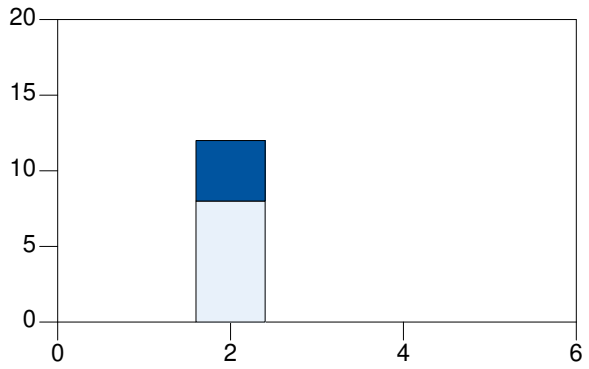
Parameter	Meaning in this example
`base 8`	Start the second bar at the first component's top.

Render this diagram

```
tools/render examples/GRA-06-003.grap
```

Try changing: Change the second component to 6.

Actual output



GRA-06-003 · grap native output

grap · exit 0

GRA-06-004

Draw prepared histogram bins

A histogram can use explicitly supplied bins and counts. Keep the widths identical and state that grap is drawing a prepared distribution rather than estimating bins.

Compare with GRA-06-003 · Stack a known component.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,9 y 0,15
bar up 1.5 ht 5 wid 3 fillcolor "wash"
bar up 4.5 ht 12 wid 3 fillcolor "wash"
bar up 7.5 ht 8 wid 3 fillcolor "wash"
.G2
```

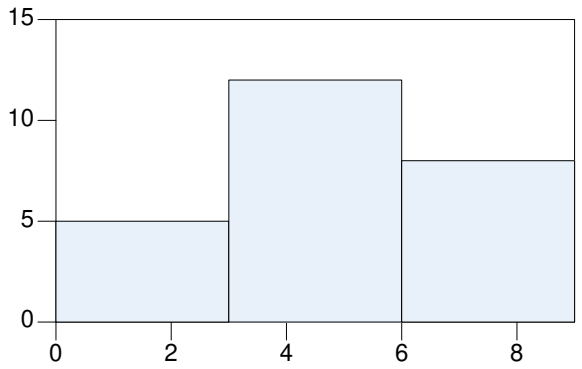
Parameter	Meaning in this example
`wid 3`	Represent the supplied three-unit histogram bins.

Render this diagram

```
tools/render examples/GRA-06-004.grap
```

Try changing: Change the middle count to 10.

Actual output



GRA-06-004 · grap native output

grap · exit 0

GRA-06-005

Offset grouped bars

Small x offsets keep two counts separate within one category. Use a fixed offset and width so every pair is directly comparable.

Compare with GRA-06-004 · Draw prepared histogram bins.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
bar up 1.8 ht 8 wid .35 fillcolor "wash"
bar up 2.2 ht 11 wid .35 fillcolor "blue"
bar up 3.8 ht 14 wid .35 fillcolor "wash"
bar up 4.2 ht 12 wid .35 fillcolor "blue"
.G2
```

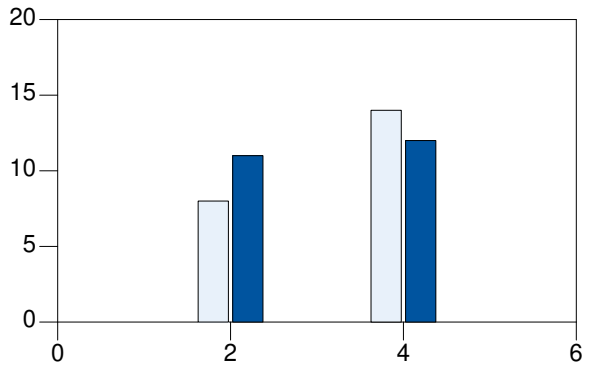
Parameter	Meaning in this example
`Offset category positions`	Place paired bars beside the same category center.

Render this diagram

```
tools/render examples/GRA-06-005.grap
```

Try changing: Swap the fill colors of the two series.

Actual output



GRA-06-005 · grap native output

grap · exit 0

GRA-06-006

Draw a prepared box summary

A box, median and whiskers can display supplied five-number statistics. Here whiskers are the stated minimum and maximum; grap applies no automatic outlier rule.

Compare with GRA-06-005 · Offset grouped bars.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
line from 3,2 to 3,16
bar 2.6,5,3.4,12 fillcolor "wash"
line from 2.6,9 to 3.4,9
line from 2.8,2 to 3.2,2
line from 2.8,16 to 3.2,16
.G2
```

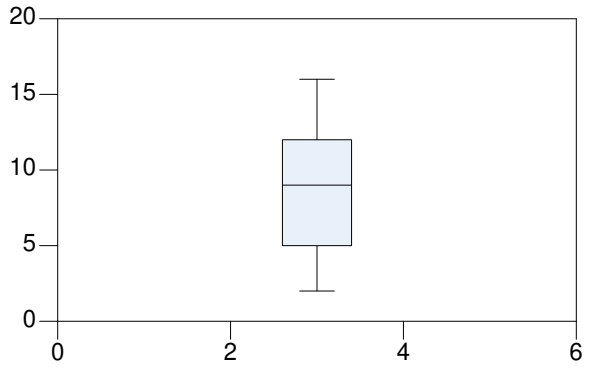
Parameter	Meaning in this example
`bar corner,corner`	Draw the interquartile box from two corners.
`Separate median line`	Draw the supplied median rather than recomputing it.

Render this diagram

```
tools/render examples/GRA-06-006.grap
```

Try changing: Change the median from 9 to 10.

Actual output



GRA-06-006 · grap native output

grap · exit 0

07 · Scientific annotations

Keep supplied uncertainty, thresholds and derived geometry distinct from the observations.

GRA-07-001

Show a supplied uncertainty interval

A vertical segment and short caps display an interval around a reading. Use the parameter table to state whether the bounds are errors, confidence limits or another supplied range.

Compare with GRA-06-006 · Draw a prepared box summary.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
line from 3,8 to 3,14
line from 2.8,8 to 3.2,8
line from 2.8,14 to 3.2,14
circle at 3,11 radius .04
.G2
```

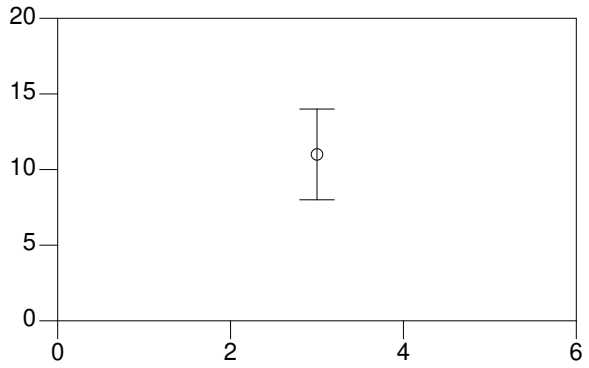
Parameter	Meaning in this example
`8 to 14`	Use the supplied lower and upper measurement bounds.

Render this diagram

```
tools/render examples/GRA-07-001.grap
```

Try changing: Widen the interval to 7 through 15.

Actual output



GRA-07-001 · grap native output

grap · exit 0

GRA-07-002

Add a capacity threshold

A horizontal reference line makes a fixed limit visible. Use a label and line style so the threshold remains identifiable without color.

Compare with GRA-07-001 · Show a supplied uncertainty interval.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
line dashed from 0,15 to 6,15
"capacity" above at 4.8,15
circle at 2,12 radius .04
.G2
```

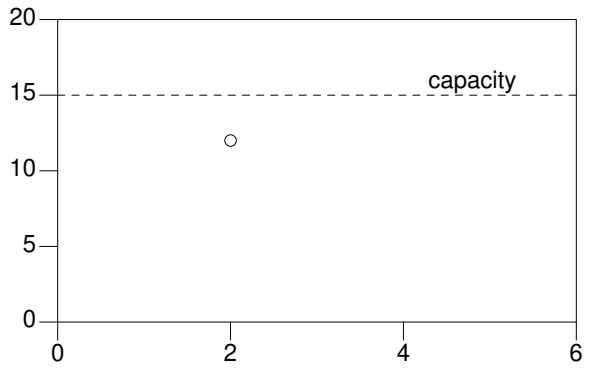
Parameter	Meaning in this example
`line dashed`	Separate the supplied threshold from observations.

Render this diagram

```
tools/render examples/GRA-07-002.grap
```

Try changing: Move the capacity to 17.

Actual output



GRA-07-002 · grap native output

grap · exit 0

GRA-07-003

Explain a change with an arrow

A directed annotation can highlight a difference between two positions. Use it to explain the supplied comparison without implying a causal effect.

Compare with GRA-07-002 · Add a capacity threshold.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 2,8 radius .04
circle at 5,14 radius .04
arrow from 2.2,8.5 to 4.8,13.5
.G2
```

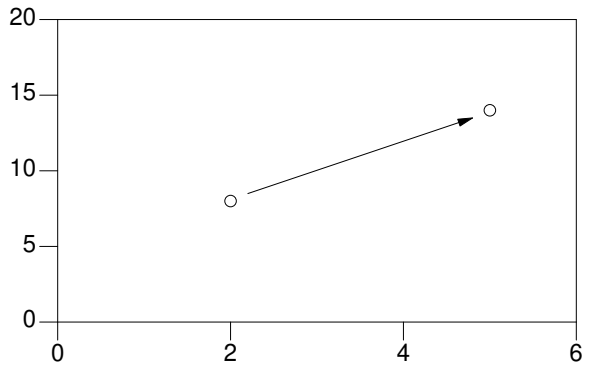
Parameter	Meaning in this example
`arrow from / to`	Point from one supplied comparison position to another.

Render this diagram

```
tools/render examples/GRA-07-003.grap
```

Try changing: Change the second reading and the arrow endpoint together.

Actual output



GRA-07-003 · grap native output

grap · exit 0

GRA-07-004

Shade a reference band

A filled rectangle can mark an acceptable range. Draw the band before observations so it does not hide the measured points.

Compare with GRA-07-003 · Explain a change with an arrow.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
bar 0,8,6,14 fillcolor "wash"
circle at 2,12 radius .04
circle at 4,16 radius .04
.G2
```

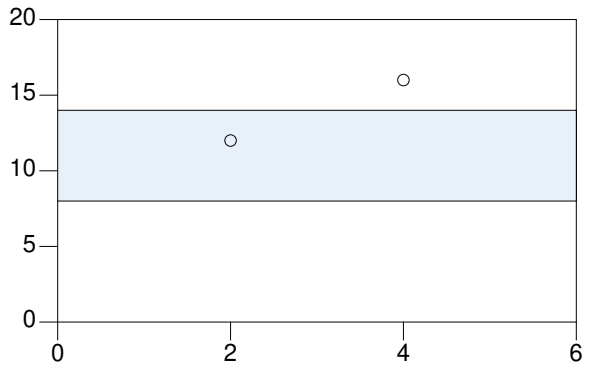
Parameter	Meaning in this example
`Filled corner rectangle`	Mark the supplied acceptable interval.

Render this diagram

```
tools/render examples/GRA-07-004.grap
```

Try changing: Change the acceptable range to 9 through 15.

Actual output



GRA-07-004 · grap native output

grap · exit 0

GRA-07-005

Draw a right-continuous cumulative curve

Repeated x coordinates create explicit vertical jumps. Use prepared vertices to keep ties and step conventions identical across tools.

Compare with GRA-07-004 · Shade a reference band.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,1
draw solid
0 0
2 0
2 .4
4 .4
4 1
6 1
.G2
```

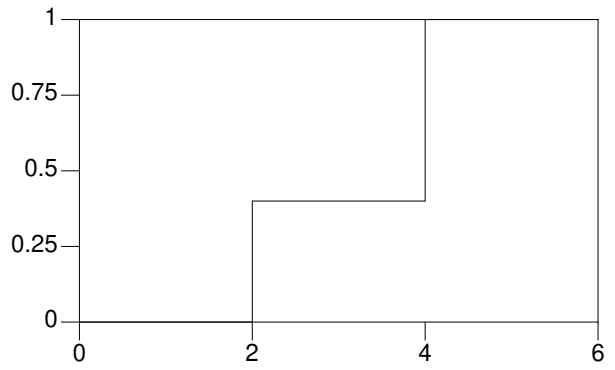
Parameter	Meaning in this example
`Repeated x values`	Place the vertical jump at its supplied observation value.

Render this diagram

```
tools/render examples/GRA-07-005.grap
```

Try changing: Move the first jump from 2 to 3.

Actual output



GRA-07-005 · grap native output

grap · exit 0

GRA-07-006

Scale marker area to count

The radius must grow with the square root of count. Use physical radii so the circle area, rather than its diameter, represents the supplied sample size.

Compare with GRA-07-005 · Draw a right-continuous cumulative curve.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 1,8 radius .03*sqrt(1) fillcolor "blue"
circle at 3,12 radius .03*sqrt(4) fillcolor "blue"
circle at 5,16 radius .03*sqrt(9) fillcolor "blue"
.G2
```

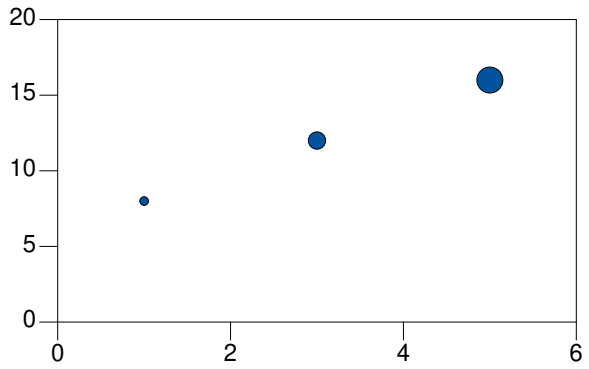
Parameter	Meaning in this example
`sqrt(count)`	Make circle area proportional to the supplied count.

Render this diagram

```
tools/render examples/GRA-07-006.grap
```

Try changing: Change the largest count from 9 to 16.

Actual output



GRA-07-006 · grap native output

grap · exit 0

08 · Macros and controlled repetition

Name repeated work while leaving the plotting rule visible in the complete source.

GRA-08-001

Name a marker operation

A macro packages a small repeated drawing statement. Use arguments for the data coordinates so the geometry stays explicit at each call.

Compare with GRA-04-004 · Draw separate markers.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
define samplemark { circle at $1,$2 radius .04; }
samplemark(1,8)
samplemark(3,14)
samplemark(5,11)
.G2
```

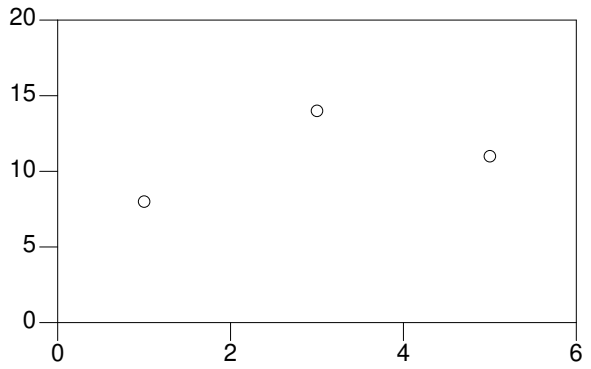
Parameter	Meaning in this example
`define / $1 / $2`	Create a marker operation with coordinate arguments.

Render this diagram

```
tools/render examples/GRA-08-001.grap
```

Try changing: Change the macro radius to .06.

Actual output



GRA-08-001 · grap native output

grap · exit 0

GRA-08-002

Generate a regular sampling grid

A for loop can enumerate known sample positions. Use it for deterministic construction rather than copying a row of nearly identical commands.

Compare with GRA-08-001 · Name a marker operation.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
for d from 1 to 5 do { circle at d,10 radius .035; }
.G2
```

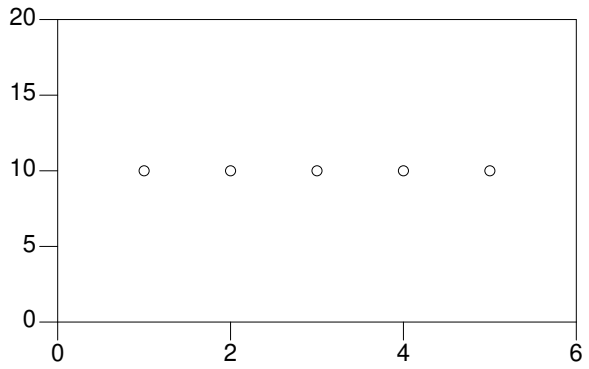
Parameter	Meaning in this example
`for / from / to`	Enumerate the supplied sampling positions.

Render this diagram

```
tools/render examples/GRA-08-002.grap
```

Try changing: Extend the upper bound to 6.

Actual output



GRA-08-002 · grap native output

grap · exit 0

GRA-08-003

Choose an explicit sampling step

A by clause sets the interval of repeated positions. Use it when the sample spacing is part of the chart definition.

Compare with GRA-08-002 · Generate a regular sampling grid.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x -.5,6.5 y 0,20
for d from 0 to 6 by 2 do { circle at d,10 radius .035; }
.G2
```

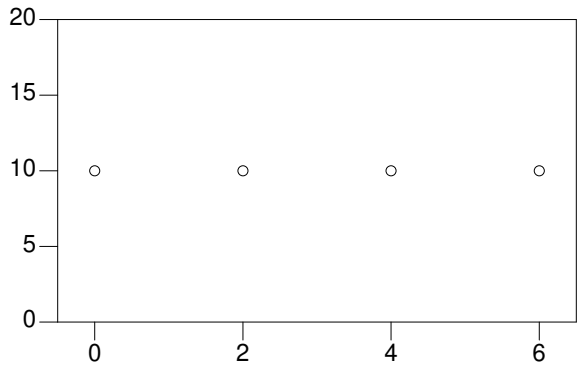
Parameter	Meaning in this example
`by 2`	Place samples two data units apart.

Render this diagram

```
tools/render examples/GRA-08-003.grap
```

Try changing: Change the interval to 3.

Actual output



GRA-08-003 · grap native output

grap · exit 0

GRA-08-004

Select a flagged point inside a loop

An if branch can change a marker when a known flag is set. Use a redundant radius difference alongside color to identify the selected observation.

Compare with GRA-08-003 · Choose an explicit sampling step.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
for d from 1 to 5 do {
 if d==3 then {
  circle at d,10 radius .07 fillcolor "blue"
 } else {
  circle at d,10 radius .035
 }
}
.G2
```

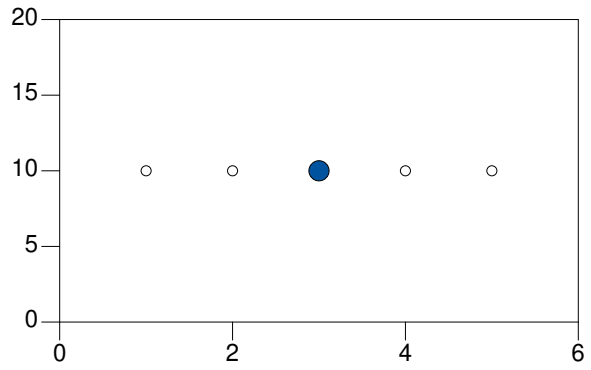
Parameter	Meaning in this example
`if / then / else`	Choose the highlighted marker for a supplied condition.

Render this diagram

```
tools/render examples/GRA-08-004.grap
```

Try changing: Select d==4 instead.

Actual output



GRA-08-004 · grap native output

grap · exit 0

GRA-08-005

Trace an analytical function

A deterministic expression can supply a complete reference curve. Use a stated sampling interval so changing it has an observable effect on smoothness.

Compare with GRA-08-004 · Select a flagged point inside a loop.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
draw solid
for t from 0 to 6 by .15 do { next at t,10+4*sin(t); }
.G2
```

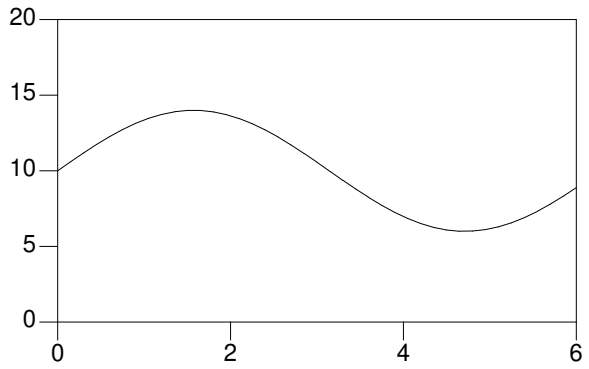
Parameter	Meaning in this example
`sin(t)`	Use radians in the supplied reference function.

Render this diagram

```
tools/render examples/GRA-08-005.grap
```

Try changing: Increase the sampling interval to .6.

Actual output



GRA-08-005 · grap native output

grap · exit 0

GRA-08-006

Format a calculated annotation

Sprintf turns an expression into readable text. Use it to show a calculated value while keeping the arithmetic in the source.

Compare with GRA-08-005 · Trace an analytical function.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
value=14-3
sprintf("Accepted: %.0f",value) at 3,12
circle at 3,value radius .04
.G2
```

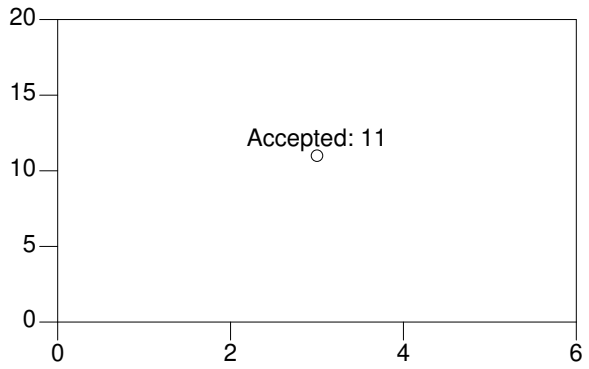
Parameter	Meaning in this example
`sprintf`	Format the calculated accepted count.

Render this diagram

```
tools/render examples/GRA-08-006.grap
```

Try changing: Change the rejected count from 3 to 4.

Actual output



GRA-08-006 · grap native output

grap · exit 0

09 · Panels and pic integration

Combine charts with explicit alignment instead of letting unrelated scales appear comparable.

GRA-09-001

Place two charts beside each other

A named graph exposes its frame to the next graph. Use this to align two independent charts on the same physical row.

Compare with GRA-02-003 · Name another coordinate system.

Complete grap source

```
.so config/render.roff
.G1
graph First
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "North"
circle at 2,12
graph Second with .Frame.w at First.Frame.e + (.7,0)
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "South"
circle at 4,15
.G2
```

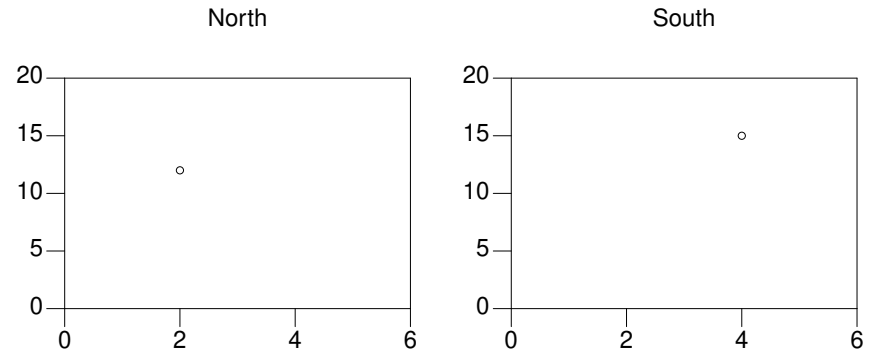
Parameter	Meaning in this example
`graph / .Frame.w`	Place the next graph relative to the previous frame.

Render this diagram

```
tools/render examples/GRA-09-001.grap
```

Try changing: Increase the gap between frames to 1.

Actual output



GRA-09-001 · grap native output

grap · exit 0

GRA-09-002

Keep panel scales identical

The same coordinate limits make a panel comparison meaningful. Use them even when one panel contains a narrower range of values.

Compare with GRA-09-001 · Place two charts beside each other.

Complete grap source

```
.so config/render.roff
.G1
graph First
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
draw solid
1 8
3 14
5 11
graph Second with .Frame.w at First.Frame.e + (.7,0)
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
draw solid
1 11
3 12
5 13
.G2
```

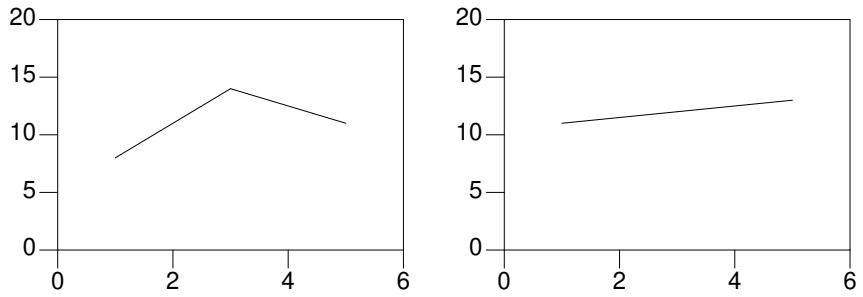
Parameter	Meaning in this example
`Repeated coord limits`	Preserve the same value-to-distance mapping in both panels.

Render this diagram

```
tools/render examples/GRA-09-002.grap
```

Try changing: Raise the second panel middle reading to 16.

Actual output



GRA-09-002 · grap native output

grap · exit 0

GRA-09-003

Stack panels vertically

A second frame can attach below the first one. Use a vertical arrangement when the figure must fit a report column.

Compare with GRA-09-002 · Keep panel scales identical.

Complete grap source

```
.so config/render.roff
.G1
graph First
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
circle at 2,12
graph Second with .Frame.n at First.Frame.s - (0,.7)
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
circle at 4,15
.G2
```

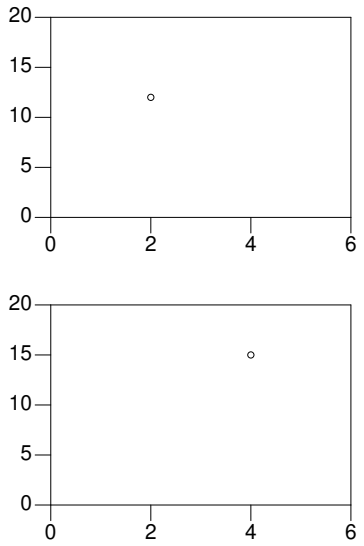
Parameter	Meaning in this example
`.Frame.n / .Frame.s`	Align the top of the second frame below the first.

Render this diagram

```
tools/render examples/GRA-09-003.grap
```

Try changing: Increase the vertical gap to 1.

Actual output



GRA-09-003 · grap native output

grap · exit 0

GRA-09-004

Add a caption in pic coordinates

An embedded pic statement can place a note relative to the frame. Use physical offsets for a caption whose clearance should not depend on data ranges.

Compare with GRA-09-003 · Stack panels vertically.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 2,12
pic "Archive readings" at Frame.n + (0,.3)
.G2
```

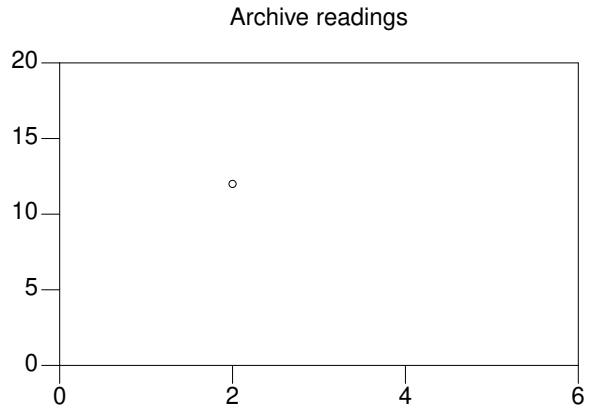
Parameter	Meaning in this example
`pic`	Pass a native drawing statement to the enclosing picture.

Render this diagram

```
tools/render examples/GRA-09-004.grap
```

Try changing: Move the caption up to .45.

Actual output



GRA-09-004 · grap native output

grap · exit 0

GRA-09-005

Add an external frame callout

A pic arrow can refer to a frame corner directly. Use it for a layout annotation, keeping data-coordinate measurements in grap statements.

Compare with GRA-09-004 · Add a caption in pic coordinates.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
circle at 2,12
pic arrow from Frame.ne + (.5,.3) to Frame.ne
pic "shared frame" at Frame.ne + (.5,.5)
.G2
```

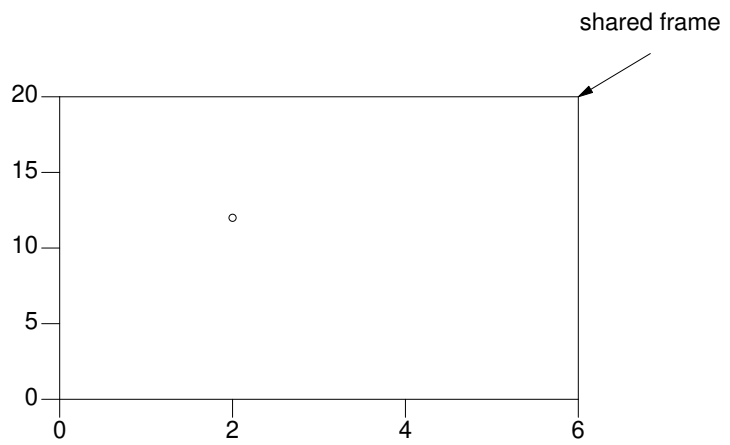
Parameter	Meaning in this example
`Frame.ne`	Refer to the frame's physical northeast corner.

Render this diagram

```
tools/render examples/GRA-09-005.grap
```

Try changing: Move the callout farther to the right.

Actual output



GRA-09-005 · grap native output

grap · exit 0

GRA-09-006

Separate a trend from a count panel

Two panels can carry distinct but related questions. Keep units and panel headings explicit so shared alignment does not imply the same measured quantity.

Compare with GRA-09-005 · Add an external frame callout.

Complete grap source

```
.so config/render.roff
.G1
graph First
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "Temperature (C)"
draw solid
1 8
3 14
5 11
graph Second with .Frame.w at First.Frame.e + (.7,0)
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "Samples"
bar up 2 ht 12 wid .8
bar up 4 ht 17 wid .8
.G2
```

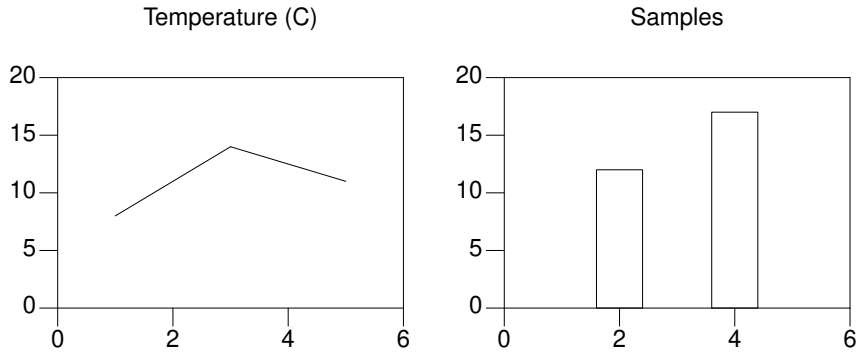
Parameter	Meaning in this example
`Panel headings`	State the different measured quantity in each panel.

Render this diagram

```
tools/render examples/GRA-09-006.grap
```

Try changing: Change the sample counts without changing temperature.

Actual output



GRA-09-006 · grap native output

grap · exit 0

10 · Finished archive charts

Combine established techniques into small figures with one stated analytical purpose.

GRA-10-001

Report intake by batch

Category labels and a zero baseline make a count report readable. Use a shared bar style and keep the batch counts supplied in the complete source.

Compare with GRA-06-001 · Draw vertical counts.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label top "Archive intake"
ticks bottom at 1 "A",3 "B",5 "C"
bar up 1 ht 8 wid .8 fillcolor "wash"
bar up 3 ht 14 wid .8 fillcolor "wash"
bar up 5 ht 11 wid .8 fillcolor "wash"
.G2
```

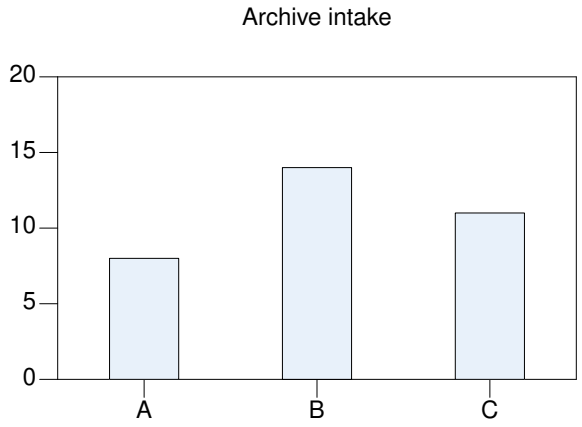
Parameter	Meaning in this example
`Zero-based categorical bars`	Compare the supplied intake counts directly.

Render this diagram

```
tools/render examples/GRA-10-001.grap
```

Try changing: Add a batch D at position 6.

Actual output



GRA-10-001 · grap native output

grap · exit 0

GRA-10-002

Report a temperature sequence

A labeled trend keeps units and sampling positions visible. Use local input so the reported observations can be inspected independently of the drawing.

Compare with GRA-10-001 · Report intake by batch.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label bottom "Day"
label left "Temperature (C)" left .35
draw solid bullet
copy "data/readings.txt"
.G2
```

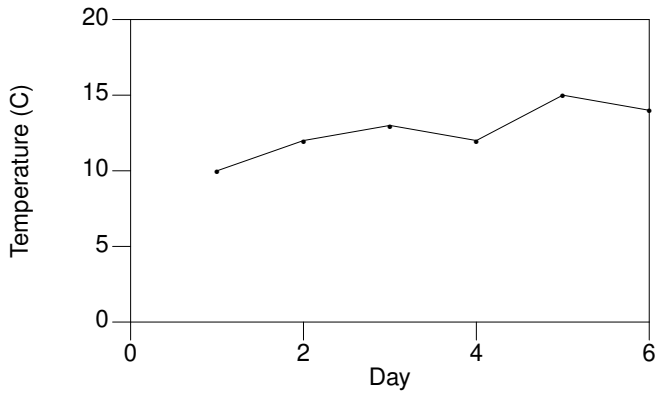
Parameter	Meaning in this example
`Local table + markers`	Show both the supplied values and their sampling positions.

Render this diagram

```
tools/render examples/GRA-10-002.grap
```

Try changing: Edit one local reading and render again.

Actual output



GRA-10-002 · grap native output

grap · exit 0

GRA-10-003

Compare accepted and rejected totals

A stacked composition keeps parts attached to their total. Use a legend in text so the two fills have an explicit meaning.

Compare with GRA-10-002 · Report a temperature sequence.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label top "Light: accepted; dark: rejected"
bar up 2 ht 9 wid .8 fillcolor "wash"
bar up 2 ht 3 base 9 wid .8 fillcolor "blue"
bar up 4 ht 14 wid .8 fillcolor "wash"
bar up 4 ht 2 base 14 wid .8 fillcolor "blue"
.G2
```

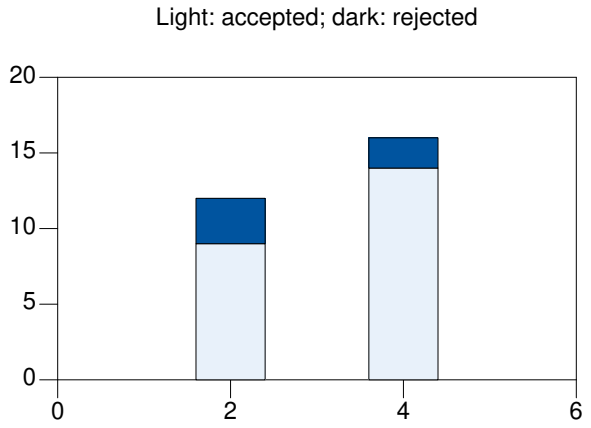
Parameter	Meaning in this example
`Stacked counts`	Keep each rejected component on top of its accepted count.

Render this diagram

```
tools/render examples/GRA-10-003.grap
```

Try changing: Change the second rejected count to 4.

Actual output



GRA-10-003 · grap native output

grap · exit 0

GRA-10-004

Check readings against a capacity

A threshold report should make exceedances visible without discarding ordinary observations. Use an explicit limit, a named line and the complete measurement sequence.

Compare with GRA-10-003 · Compare accepted and rejected totals.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
line dashed from 0,13 to 6,13
label top "Capacity: 13"
draw solid bullet
copy "data/readings.txt"
.G2
```

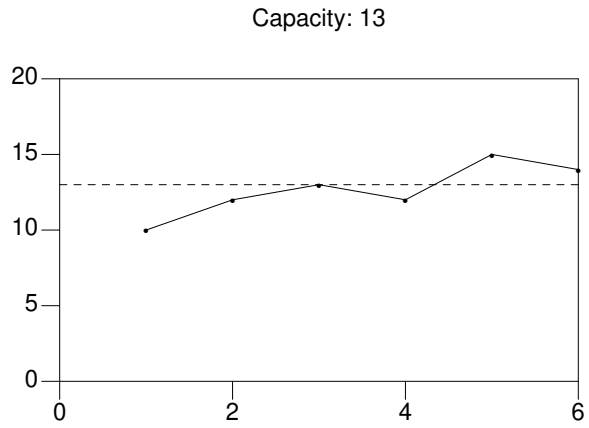
Parameter	Meaning in this example
`Named threshold`	Compare every supplied reading with one fixed limit.

Render this diagram

```
tools/render examples/GRA-10-004.grap
```

Try changing: Move the capacity to 15.

Actual output



GRA-10-004 · grap native output

grap · exit 0

GRA-10-005

Report two independent station trends

Named streams and different line styles distinguish stations. Use a text legend so the reader does not have to infer which pattern belongs to each station.

Compare with GRA-10-004 · Check readings against a capacity.

Complete grap source

```
.so config/render.roff
.G1
frame ht 2.1 wid 3.6
coord x 0,6 y 0,20
label top "Solid: North; dashed: South"
draw North solid color "blue"
draw South dashed
next North at 1,8
next North at 3,14
next North at 5,11
next South at 1,12
next South at 3,10
next South at 5,16
.G2
```

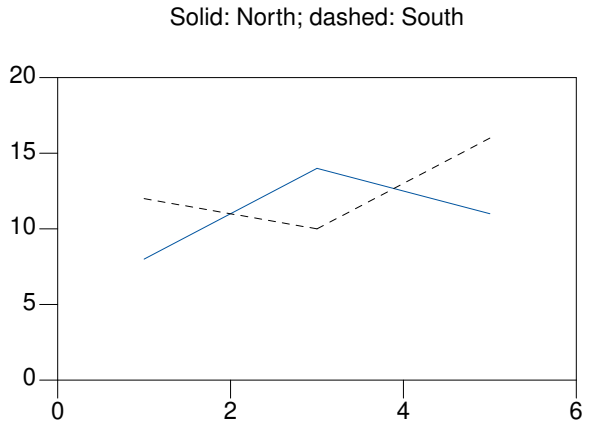
Parameter	Meaning in this example
`Named streams + legend`	Keep the two supplied station sequences independent.

Render this diagram

```
tools/render examples/GRA-10-005.grap
```

Try changing: Swap the station line styles.

Actual output



GRA-10-005 · grap native output

grap · exit 0

GRA-10-006

Finish a paired archive report

A paired figure can show observations beside their operational context. Use separate panel captions and preserve the common day domain while naming the different quantities.

Compare with GRA-10-005 · Report two independent station trends.

Complete grap source

```
.so config/render.roff
.G1
graph First
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "Observed trend"
draw solid bullet
copy "data/readings.txt"
graph Second with .Frame.w at First.Frame.e + (.7,0)
frame ht 1.6 wid 2.4
coord x 0,6 y 0,20
label top "Intake counts"
bar up 1 ht 8 wid .8 fillcolor "wash"
bar up 3 ht 14 wid .8 fillcolor "wash"
bar up 5 ht 11 wid .8 fillcolor "wash"
.G2
```

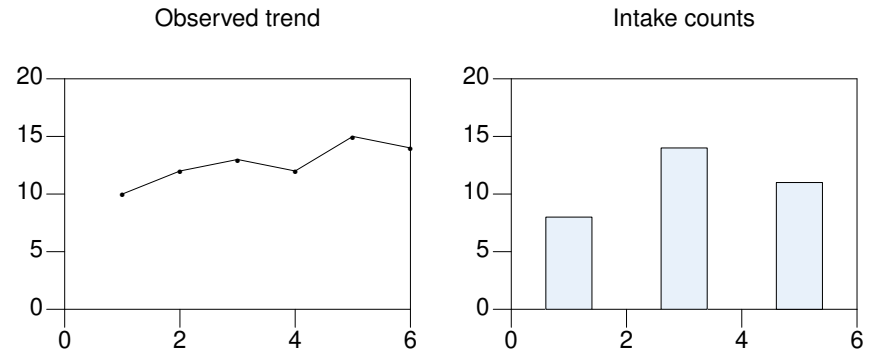
Parameter	Meaning in this example
`Paired report`	Combine two established chart types with explicit panel meanings.

Render this diagram

```
tools/render examples/GRA-10-006.grap
```

Try changing: Change the second panel to accepted counts.

Actual output



GRA-10-006 · grap native output

grap · exit 0

Choosing a diagram

Start with the question and the relationship to communicate. Use the smallest example that contains the needed idea, then add labels, grouping and styling only where they clarify it. Inspect the native figure at its intended reading size. The examples draw supplied process meanings and statistics; a drawing does not execute a workflow or establish a causal claim.

Goal	Start here
Read a local numeric file	Chapter 05
Compare counts or prepared distributions	Chapter 06
Show supplied uncertainty or thresholds	Chapter 07
Construct repeated drawing rules	Chapter 08
Align related panels	Chapter 09
Finish an archive report	Chapter 10

Feature coverage

Feature family	Chapter
First graphs	01
Coordinates and ranges	02
Axes, ticks and grids	03
Lines, markers and series	04
Local data and expressions	05
Bars and prepared distributions	06
Scientific annotations	07
Macros and controlled repetition	08
Panels and pic integration	09
Finished archive charts	10

References and licensing

grap project and manual and the bundled grap 1.49 manual installed with the native tool.

Compare native chart syntax in the gnuplot tour, GNU Octave tour and R / ggplot2 tour. The pic tour develops the geometric language used by grap.

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Example and command index

- GRA-01-001 · Place one reading
- GRA-01-002 · Connect successive readings
- GRA-01-003 · Choose the axis ticks
- GRA-01-004 · Name the axes and units
- GRA-01-005 · Read a small number list
- GRA-01-006 · Plot a numeric label
- GRA-02-001 · Let the data set the range
- GRA-02-002 · Retain a zero baseline
- GRA-02-003 · Name another coordinate system
- GRA-02-004 · Use a logarithmic horizontal axis
- GRA-02-005 · Use a logarithmic value axis
- GRA-02-006 · Convert the values before drawing
- GRA-03-001 · Name categorical tick positions
- GRA-03-002 · Generate regularly spaced ticks
- GRA-03-003 · Format tick precision
- GRA-03-004 · Turn ticks outward
- GRA-03-005 · Add a light reading grid
- GRA-03-006 · Align the value label horizontally
- GRA-04-001 · Name independent series
- GRA-04-002 · Set a line color
- GRA-04-003 · Use a dashed comparison
- GRA-04-004 · Draw separate markers
- GRA-04-005 · Label one selected reading
- GRA-04-006 · Add markers to a line
- GRA-05-001 · Read the local measurement table
- GRA-05-002 · Transform columns while reading
- GRA-05-003 · Filter flagged observations
- GRA-05-004 · Embed data for a standalone snippet
- GRA-05-005 · Calculate a transformed reading
- GRA-05-006 · Print a checked intermediate value
- GRA-06-001 · Draw vertical counts
- GRA-06-002 · Draw horizontal counts
- GRA-06-003 · Stack a known component
- GRA-06-004 · Draw prepared histogram bins
- GRA-06-005 · Offset grouped bars
- GRA-06-006 · Draw a prepared box summary
- GRA-07-001 · Show a supplied uncertainty interval
- GRA-07-002 · Add a capacity threshold
- GRA-07-003 · Explain a change with an arrow
- GRA-07-004 · Shade a reference band
- GRA-07-005 · Draw a right-continuous cumulative curve
- GRA-07-006 · Scale marker area to count
- GRA-08-001 · Name a marker operation
- GRA-08-002 · Generate a regular sampling grid
- GRA-08-003 · Choose an explicit sampling step
- GRA-08-004 · Select a flagged point inside a loop
- GRA-08-005 · Trace an analytical function
- GRA-08-006 · Format a calculated annotation
- GRA-09-001 · Place two charts beside each other
- GRA-09-002 · Keep panel scales identical
- GRA-09-003 · Stack panels vertically
- GRA-09-004 · Add a caption in pic coordinates
- GRA-09-005 · Add an external frame callout
- GRA-09-006 · Separate a trend from a count panel

- GRA-10-001 · Report intake by batch
- GRA-10-002 · Report a temperature sequence
- GRA-10-003 · Compare accepted and rejected totals
- GRA-10-004 · Check readings against a capacity
- GRA-10-005 · Report two independent station trends
- GRA-10-006 · Finish a paired archive report

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